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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/710,698	07/29/2004	Tai-Yuan Chen	12739-US-PA	4697

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JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE  
7 FLOOR-1, NO. 100  
ROOSEVELT ROAD, SECTION 2  
TAIPEI, 100  
TAIWAN

EXAMINER
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SALZMAN, KOURTNEY R

ART UNIT	PAPER NUMBER
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4128

NOTIFICATION DATE	DELIVERY MODE
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12/13/2007

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

USA@JCIPGROUP.COM.TW

<b>Office Action Summary</b>	<b>Application No.</b> 10/710,698	<b>Applicant(s)</b> CHEN ET AL.	
	<b>Examiner</b> Kourtney R. Salzman	<b>Art Unit</b> 4128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on November 14, 2007.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 8-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 8-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on July 29, 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Summary***

1. This is the initial Office Action based on the Physical Vapor Deposition Process and Apparatus Therefor, amended to be Apparatus for Physical Vapor Deposition, application 10/710,698, filed on July 29, 2004.

### ***Priority***

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Election/Restrictions***

3. Applicant's election without traverse of claims 8-15 in the reply filed on November 16, 2007 is acknowledged.

4. Applicant's election of group 3, claims 8-15 in the reply filed on November 14, 2007 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

5. Claims 8-15 are pending and have been fully considered.

### ***Drawings***

6. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct

any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

7. The disclosure is objected to because of the following informalities: In paragraph 47, figure 36A is referred to, not present in the pending application. The examiner believes this refers to figure 6A.

Appropriate correction is required.

8. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The title, as amended in the submission sent November 14, 2007, does not reflect that the invention still contains a process (claims 13-15). The amended title should reflect that an apparatus and process are still present in the pending application.

### ***Claim Objections***

9. Claim 9 is objected to because of the following informalities: The third limitation of claim 9 refers to "a plate disposed", however this piece is referred to within the specification as "a platen". The examiner interprets platen as the correct term and has examined the application utilizing this interpretation. The claim limitation should read, "a platen disposed..."

Appropriate correction is required.

***Claim Rejections - 35 USC § 102***

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. Claims 8, 11 and 12 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over FU et al(US 6,251,242).

Regarding claim 8, FU et al teaches magnetron plasma sputter reactors as shown in figure 1. Reference numbers 12, the target, and 50, the chamber body, define the reaction chamber. The rotational aspect of the magnetron is addressed in column 7, lines 40-43. In column 6, lines 17-19, FU et al teaches the relative positions of these pieces by stating, “The target 12 is vacuum sealed to a grounded vacuum chamber body 50 through a dielectric target insulator.” Figure 1 shows the magnets, reference numbers 30 and 32 respectively, disposed outside and above the reaction chamber. Herein, the examiner interprets one set of magnets to be the two left of the central axis and the second set of magnets to be the two right of the central axis. Each set is both axially and planarly-symmetric as shown in the figure and FU et al states that the “sputter target and magnetron [are] symmetrically arranged about a central axis” in column 5, lines 9-11. The orientation of the magnets is shown in figure 1, where they are shown to have opposite magnetic poles to each other both within the

sets and between the sets as well, as designated by the N and S shown on the magnets.

In the alternative, the combination of the magnet structure shown in figure 1 and the alternative magnetron embodiment comprising the rotation of the magnet structure of figure 3 of FU et al (in column 7, lines 40-41, FU et al teaches the motor shaft of figure 3 rotates the magnetron about an axis, utilizing a nearly identical sputtering chamber to figure 1) would be viable as well to create the rotating magnetron of instant claim 1. The addition of more magnets to the magnets, identified in figure 3 by reference numbers 30 and 84, can be used as "mechanical counterbalancing... to reduce vibrations in the rotation of the axially offset magnetron"(column 7, lines 43-45).

Regarding claim 11, in conjunction with the rejection of claim 8 shown above, as shown in FU et al figure 1, the magnets can be identified for instant application comparison by numbering the magnets from left to right in the order of 1, 2, 4, 3, so magnets 1 and 3(and 2 and 4) are axially symmetrical to each other. The sets of magnets are then organized into sets containing those to the left of the axis as group 1(1 and 2) and those to the right of the axis as group 2(3 and 4). Magnets 1 and 4 are shown to have opposite pole positions, just as magnets 2 and 3 are.

Regarding claim 12, since the magnetron is stated to be “generally circularly symmetric”, the magnetron would inherently also be planarly-symmetric as well where the plane of symmetry vertically crosses the location where the both inner and both outer magnets, respectively, are adjacent to each other.

***Claim Rejections - 35 USC § 103***

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over FU et al (US 6,251,242), as applied to the rejection of claims 8, 11 and 12 as shown above, in view of HINTERSCHUSTER et al (US 5,538,609).

Regarding claim 9, in conjunction with the rejection of claim 8, FU et al teaches all the limitations of claim 8. The chamber is defined in column 5, lines 29-31, where FU et al states “the target 12 also includes a flange 29 that is vacuum sealed to the chamber body 50 of the sputter reactor 10.” A platen is shown at the bottom of the chamber in figure 1 in FU et al. In column 6, lines 20-21, FU et al states, “The wafer 20 is clamped to a heater pedestal electrode 54”, where the pedestal electrode is interpreted to be the platen.

FU et al does not appear to explicitly discuss the use of a target backboard for mounting the target thereon.

However, HINTERSCHUSTER et al discloses a cathodic sputter system comprising a rotating magnetron, which does utilize a target backplate. The target backplate, herein interpreted as the target backboard, is shown in the sole figure of the application as reference number 22, behind the target material, 10(column 2, lines 14-18).

At the time of invention, it would have been obvious to one of ordinary skill in the art to combine the magnet and chamber structure of FU et al with the target backboard of HINTERSCHUSTER et al because the use of a backboard makes the target stronger than used in lieu of a backboard. HINTERSCHUSTER et al states in column 2, lines 50-53, a backboard is beneficial because it “will not bow or become deformed during the sputtering process”. Since the target shown in figure 1 of FU et al is more complex than the typical target metallic sheet, due to the magnet modifications, a backboard preventing target deformation would be a beneficial addition. Therefore, at the time of the invention, the addition of a backboard, as described in HINTERSCHUSTER et al, to the target and magnetron apparatus, as described in FU et al, would be help sustain the target effectively during the duration of production of the “large volume or thickness of a plasma” suggested by FU et al in column 3, lines 39-40.



Regarding claim 10, FU et al shows the central axis or proposed plane of symmetry as reference number 16, in figure 1. A target backboard is utilized over the entire backside area of the target. Since the target shown in figure 1, reference number 12, is symmetrical, the backplate as well will be symmetric about the central axis and plane of symmetry. While, as stated in the 102/103 rejection of claim 8 above, figure 1 does not expressly show rotation, the magnetic field is stated to "travel generally horizontally and radially with respect to the target central axis 16" in column 6, lines 1-2, anticipating the movement of the magnetron as well. Also as seen in figure 3 of FU et al, the rotation of the magnetron shown is also about the designated axis, also reference number 16.

14. Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over FU et al (US 6,251,242), in view of BEARDMORE et al (US 3,869,386).

Regarding claim 13, FU et al teaches magnetron plasma sputter reactors as shown in figure 1. Reference numbers 12, the target, and 50, the chamber body, define the reaction chamber. The rotational aspect of the magnetron is addressed in column 7, lines 40-43. In column 6, lines 17-19, FU et al teaches the relative positions of these pieces by stating, "The target 12 is vacuum sealed to a grounded vacuum chamber body 50 through a dielectric target insulator." Figure 1 shows the magnets, reference numbers 30 and 32 respectively, disposed outside and above the reaction chamber. Herein, the examiner interprets one set of magnets to be the two left of the central axis and the second set of magnets to be the two right of the central axis. Each set is both axially and

planarly-symmetric as shown in the figure and FU et al states that the “sputter target and magnetron [are] symmetrically arranged about a central axis” in column 5, lines 9-11. The orientation of the magnets is shown in figure 1, where they are shown to have opposite magnetic poles to each other both within the sets and between the sets as well, as designated by the N and S shown on the magnets.

In the alternative, the combination of the magnet structure shown in figure 1 and the alternative magnetron embodiment comprising the rotation of the magnet structure of figure 3 of FU et al (in column 7, lines 40-41, FU et al teaches the motor shaft of figure 3 rotates the magnetron about an axis, utilizing a nearly identical sputtering chamber to figure 1) would be viable as well to create the rotating magnetron of instant claim 1. The addition of more magnets to the magnets, identified in figure 3 by reference numbers 30 and 84, can be used as “mechanical counterbalancing... to reduce vibrations in the rotation of the axially offset magnetron”(column 7, lines 43-45).

FU et al does not appear to explicitly state the progression of steps in beginning rotation followed by sputtering and maintaining rotation throughout the sputtering process, as disclosed in claim 13 of the pending application.

However, BEARDMORE et al discloses a method of sputter deposition of materials comprising times of operation for the magnetron in the sputter apparatus. BEARDMORE et al first states before the sputter beings, "no voltage is applied between the cathode 12 and the target 17 or jig 18 at this time, so ionic bombardment does not take place" in column 4, lines 5-9. The method of BEARDMORE et al then requires the beginning of the rotation of the magnetron (column 4, lines 10-17). In column 4, lines 18-21, BEARDMORE et al states that "this rotating magnetic field is maintained, and direct current is supplied to each of the electromagnets 19 and 20, throughout the whole sputtering process.

At the time of the invention, one of ordinary skill in the art would have been motivated to combine the magnetron layout of FU et al with the operational characteristics of BEARDMORE et al because controlling the magnetic fields produced through the current during rotation is beneficial to the deposition process. BEARDMORE et al states in column 4, lines 30-33, "the action of the rotating magnetic field is to improve the uniformity of deposition obtained on the substrates", which increases the quality of the films deposited. Therefore, it would have been obvious to one of ordinary skill in the art to rotate the magnetron of FU et al continuously in the manner provided in BEARDMORE et al to produce a predictably better quality film.

Regarding claims 14 and 15, in conjunction with the previous rejection of claim 13, figure 1 of FU et al shows two sets of axially-symmetrical magnets. As described above, it would be obvious to rotate this magnetron by supplying a "motor 90 [that] has a shaft connected to the yoke 88 at the target axis 16 and rotating the magnetron 82 about that axis 16 at a few hundred rpm" as FU et al states in column 7, lines 40-43, as shown to be applied to figure 3. If the magnetron rotates continuously, it is obvious it would rotate at least 180n or 360n degrees. Also see BEARDMORE(column 4, lines 5-21) for additional evidence of the conventional aspects of rotation.

### ***Conclusion***

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kourtney R. Salzman whose telephone number is (571) 270-5117. The examiner can normally be reached on Monday to Friday 7AM to 4PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Barbara Gilliam can be reached on (571) 272-1330. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 4128

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Krs

//Barbara L. Gilliam//

Supervisory Patent Examiner, Art Unit 4128